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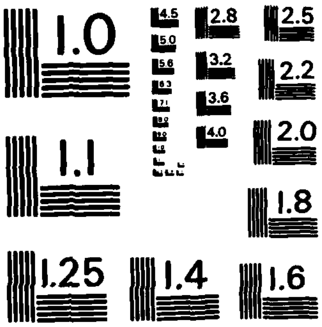

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SOPHISTICATED JAMMERS AND ADAPTIVE ARRAYS

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This report describes progress under Naval Air Systems Command Contract N00019-81-C-0093 during the third quarterly period. Research on the behavior of adaptive arrays with sophisticated jammers is summarized.

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I. INTRODUCTION

This report describes progress under Naval Air Systems Command Contract N00019-81-C-0093 for the third quarterly period. This contract involves studies on the effectiveness of two types of jamming against adaptive arrays: envelope modulated jammers and cross-polarized jammers. Our progress during the third quarter is described below.

II. PROGRESS

A. Envelope Modulated Jamming

During the third quarter, we have continued our studies on the effects of modulated jammers. A technical report was published [1] describing our initial approach to this problem. This report analyses array behavior when the interference has single-frequency, double-sideband, suppressed carrier modulation. We chose this special modulation as a starting point because it leads to a weight differential equation that may be solved with a single recursion equation (as explained in [1]).

During the quarter, we have also generalized the method described in [1] to allow us to handle interference with arbitrary periodic envelope modulation. Our approach is to reduce the differential equations for the periodic steady-state weights to an infinite system of linear equations. These equations are then truncated and solved numerically. This method allows us to determine the weight behavior in the array due to any interference signal with periodic envelope modulation. From the weights, other quantities of interest such as the desired signal modulation, output SINR variation, etc., may be determined.

We have used this method to study the behavior of the array with double-sideband, amplitude modulated (AM) interference. (This interference differs from that in [1] in that it contains a carrier.) We have determined the effect of each interference parameter (arrival angle, power, and modulation frequency) on the array. A report on this work is in preparation.

B. Element Patterns in Adaptive Arrays

During the last quarter we have also published a short report [2] describing a simple method for choosing element patterns in an adaptive array. This work was done last year during our studies on element pattern effects. Our purpose here was simply to document this work in the form of a Contract report.

The method developed in this report is to build up the array one element at a time until it achieves the desired SINR performance. The procedure is to start with an initial set of element patterns, evaluate the performance of this initial set, and then augment the array by adding new elements until the performance is suitable. This technique is useful for arrays that must receive desired signals from any angle within some sector of space (e.g., as in aircraft communications).

REFERENCES

1. A.S. Al-Ruwais and R.T. Compton, Jr., "Adaptive Array Behavior with Sinusoidal Envelope Modulated Jamming", Report 713603-5, March 1982, The Ohio State University ElectroScience Laboratory, Columbus, Ohio; prepared under Contract N00019-81-C-0093 for Naval Air Systems Command.

2. R.T. Compton, Jr., "A Method of Choosing Element Patterns in an Adaptive Array", Report 713603-4, January 1982, The Ohio State University ElectroScience Laboratory, Columbus, Ohio; prepared under Contract N00019-81-C-0093 for Naval Air Systems Command.